FRD ACTIVITIES REPORT
October - December 2009

RESEARCH PROGRAMS

ET Probe

The 2009 field deployments for the Extreme Turbulence (ET) probes ended in early December. This was the first time the probes have been deployed in a marine environment over an extended period of time. Although the 2009 hurricane season was quiet, the deployments still provided much useful information on keeping the probes running over extended periods in a harsh environment. One probe was deployed at the end of a 560 m pier in Duck, NC operated by the U.S. Army Corps of Engineers. This probe operated throughout the deployment period albeit with some gaps in the data. The largest gap occurred when a solder joint failed on a wire connector. Overall, the probe at Duck collected over 20 gigabytes of raw data. The highest observed wind speeds were associated with extratropical lows moving up the Atlantic Coast.

A second ET probe was deployed in the Florida Keys at Tennessee Reef. This deployment was a last-minute addition organized very quickly in September, and it ended up being less successful. The main problem was that the location was only accessible by boat, so we had to rely on a person at the Keys Marine Laboratory for transportation to the site, power, and servicing. This person underestimated the effort required and ran into problems due to a serious breakdown of his boat. In addition, this site had a large bird population that quickly coated the probe with feces that plugged some of the pressure ports. Nonetheless, the deployment was a learning experience that will lead to modifications of the probe design, including the installation of spikes to deter birds from landing on the top of the probe. (richard.eckman@noaa.gov, Roger Carter, Tom Strong, Shane Beard, Randy Johnson)

WISDOM

Randy Johnson, Shane Beard, and Kirk Clawson completed a four-week deployment in the Azores, in Dakar, Senegal, and in Bermuda, respectively, in support of the 2009 field campaign. Unfortunately there was not much tropical storm development in the tropical Atlantic during deployment. Tropical Depression 8 (25-26 September), Tropical Storm Grace (4-6 October), and Tropical Storm Henri (6-8 October) were the only systems of note. However, the team successfully launched a total of 30 balloons: 7 from the Azores, 6 from Bermuda, and 17 from Dakar, Senegal. One of the balloons launched from the Azores on 05 October traveled over Paris, France, then Moscow, Russia, and was last observed near Tashkent, Kyrgyzstan. A balloon launched from Bermuda on 04 October traveled over Morocco, then Rome, Italy, and was last observed over Pakistan. Several balloons launched from Senegal traveled west across the Atlantic Ocean and were last observed over northern South America.

The launch equipment used in the Azores, Bermuda and Dakar for the WISDOM project has been returned to the NOAA Lab in Boulder, Colorado. All of the WISDOM Balloon Launch Reports, created for each launch by the three deployed FRD personnel, have been sent to Tim Lachenmeier at Near Space Corporation in Tillimook, Oregon for further analysis. (Kirk.Clawson@noaa.gov, Randy Johnson, and Shane Beard)

U.S. Historical Climatological Network - Modernization

FRD has been tasked to help with the quality control of the new Historical Climate Network – Modernization (HCN-M) program. The HCN-M is an offshoot of the U.S. Climate Reference Network, but HCN-M is focused solely on temperature and precipitation. Currently there are 33 stations located across Alabama and the Southwest United States.

A number of new products have been developed to assist with FRD's efforts to provide quality control of the data and determine instrument malfunctions. These new products have been placed on a newly created web site located at http://www.noaa.inel.gov/crn/crn.htm. One new product is a daily contour map of maximum and minimum air temperature and precipitation. The contour maps show a bull's-eye where there could be possible instrumentation problems. Another new product combines all of the hourly flag files into a single file which makes it easier for finding reoccurring problems. A third product is a map of all the daily flags. This map is a visual representation of all problem stations and will be used to plan maintenance trips. A fourth product is a time history plot of flag occurrences for each station. All of these products are reviewed daily in order to find instrumentation problems, which are reported as they occur to the ATDD Supervisory Engineer so that the problem can be fixed. A summary of instrumentation problems together with a report of newly created products are submitted monthly. Overall, the stations are performing rather well. (Jason.rich@noaa.gov and Neil Hukari)

EPA Roadside Sound Barrier Tracer Study

The paper "Tracer studies to characterize the effects of roadside noise barriers on near-road pollutant dispersion under varying atmospheric stability conditions" was published by *Atmospheric Environment* online in November. It will appear in print in early 2010. The paper has generated considerable public interest. FRD staff conducted extended phone interviews with newspaper transportation reporters from the Bergen Record (northern New Jersey) and the Boston Globe and stories appeared in each of these newspapers. The story was also picked up by the Baltimore Sun and a Canadian wire service. An additional phone interview was conducted with the host of a live radio science show produced by Univision in Puerto Rico on December 30th. The broadcast was in Spanish with the host providing interpretation. (Dennis.Finn@noaa.gov)

As a follow-on to the field study conducted in Idaho last year, a small study of vehicle-induced turbulence began in November. A team from FRD installed a series of four sonic anemometers in a road cut along a busy section of Interstate 15 in Las Vegas, NV. Steve Perry and Vlad Isakov from the EPA, former colleagues from NOAA's ASMD, assisted with the installation. The

anemometers will remain in place for several weeks of data collection. (Kirk.Clawson@noaa.gov and Tom Strong)

JU2003 Urban Plume Dispersion

The paper "Analysis of urban atmosphere plume concentration fluctuations" passed ARL review and was submitted to *Boundary Layer Meteorology* in early November. (Dennis.Finn@noaa.gov)

Miscellaneous

FRD has been closely involved in a nascent collaboration between NOAA and the U.S. Department of Energy to investigate improvements in short-range forecasts for wind-energy applications. This is an important issue for the wind-energy industry, because rapid changes in the wind speed can be highly disruptive to the electrical grid when the output from wind farms changes unexpectedly. FRD and other divisions in ARL may participate in a field study that will deploy additional instrumentation to a limited region to determine whether assimilation of these new data into a high-resolution prognostic model will improve short-range forecasts. (Kirk.Clawson@noaa.gov, Rick Eckman)

NOAA/IDAHO NATIONAL LABORATORY (INL) METEOROLOGICAL RESEARCH PARTNERSHIP

Emergency Operations Center (EOC)

Members of the INL EOC Emergency Response Organization are required to attend one classroom training and at least two drills throughout the year. All FRD EOC team members completed their classroom requalification during October and November.

Dennis Finn participated in the EOC quarterly assessment drill conducted on December 10. The scenario involved a low volume spill of a compound related to sodium hydroxide at a CWI building at MFC and the resultant plume was small. It was not possible to use the ALOHA plume model because the chemical was not included in the CAMEO database.

INL Hazardous Weather Alert System

Six Hazardous Weather Alerts were issued by FRD for the INL during the last quarter. All 6 statements were issued for high winds as weather systems passed over the area. The local Pocatello NWSFO did not act independently on any the six statements, thereby indicating a more watchful coverage of severe INL weather by the FRD duty meteorologist. (Neil.Hukari@noaa.gov and Jason Rich)

Transport and Dispersion Modeling

Work proceeded on developing the code necessary for utilizing INL mesonet observations in HYSPLIT. This consisted of three main lines of effort. The first line of work involved developing the code necessary for accessing the mesonet database in accordance with requests from the user interface, making the appropriate calculations using each tower's data, and preparing an intermediate output file in the desired format. The second line of effort involved accessing this intermediate file, interpolating the data across the surface grid, and performing the necessary calculations to generate a spatial 3-d meteorological grid. The data for each 3-d meteorological grid time period was then packed into ARL format files compatible with HYSPLIT.

The third line of effort involved initial trials to execute complete model runs, from user request through the browser interface all the way to output of dose map plume plots. It was at this step that progress became severely stalled. All of the component programs executed normally, but the resultant plume plots were very anomalous with plumes limited to a small circular pattern restricted to about 2 km from the source. The packed files generated by the prototype packing program were evaluated using the various ARL utility check programs and there were no obvious problems in the packed files. The code was carefully evaluated to ensure that all of the appropriate subroutines were being called, with the correct arguments, and the input and output from each subroutine was correct, all to no avail. Finally, at the end of the quarter, it was discovered that the problem appeared to be related to some aspect of using the terrain sigma vertical coordinate system in HYSPLIT. Runs using absolute pressure coordinates succeeded whereas otherwise identical runs using terrain sigma coordinates failed. When this issue is resolved, testing of the overall software package can again proceed. (Dennis.Finn@noaa.gov, Roger Carter, and Brad Reese, Rick Eckman)

NOAA INL Mesoscale Meteorological Network (Mesonet)

We are continuing with our planned improvements to the single frequency radio network used to retrieve the data from the INL Mesonet. Five stations have now been converted to use the newer 'one way data protocol' as a test. Our initial conversion attempts uncovered some problems with the LoggerNet software provided by Campbell Scientific. These were corrected by Campbell Scientific and the stations are now working. So far, very little difference has been observed between the 'one way data' stations and the other stations. A new directional antenna has been installed at one station which has allowed us to further simplify the network topology. A heater has been installed at one station to help prevent apparent low temperature frequency drift in the radio. System operation will be observed during the winter to see what effect these changes have on operations. So far, the system has been working very well this winter, but much cold weather still lies ahead. (Roger.Carter@noaa.gov, Shane Beard, Tom Strong, Brad Reese, Randy Johnson)

Miscellaneous

In 2009 FRD completed an effort to analyze five years of INL Mesonet data and provide the results in specific formats suitable for Nuclear Regulatory Commission dispersion models. This was associated with a relicensing effort for the Advanced Test Reactor (ATR) at the INL. In December, FRD received a follow-on request from the INL for additional work related to the ATR relicensing. The new effort would involve running the MDIFF dispersion model using five years of archived Mesonet data and using the output to derive various statistical dispersion parameters. In theory the modeling could be done with the new HYSPLIT modeling system, but this system will not be ready in time to meet the deadline for the ATR project. The modeling is expected to begin in the second quarter of fiscal year 2010. (richard.eckman@noaa.gov)

OTHER ACTIVITIES

Papers

Finn, D., K.L. Clawson, R.G. Carter, J.D. Rich, R.M. Eckman, S.G. Perry, V. Isakov$_2$, and D.K. Heist, 2009: Tracer studies to characterize the effects of roadside noise barriers on near-road pollutant dispersion under varying atmospheric stability conditions. (Published online in November; in print early 2010)

Finn, D., K.L. Clawson, R.G. Carter, J.D. Rich, and C. Biltoft, 2009: Analysis of urban atmosphere plume concentration fluctuations. (Passed ARL review and submitted to Boundary Layer Meteorology)

Safety

Roger Carter gave a slide presentation, originally prepared by John Schneider from ESRL, on the NRC consequences of not following the regulations at ESRL at the October FRD staff meeting. It was also announced at the meeting that Jason Rich would be replacing Roger Carter on the FRD Safety Team beginning January 1, 2010.

At the November staff meeting, Donna Harris gave a presentation on nutrition in compliance with the Fed Get Fit Day.

All employees viewed “Caution Holiday Hazards” by Educational Resources, Inc., at the December staff meeting.

On December 10, 2009, the Idaho Falls Fire Department completed a fire safety inspection of the FRD facility. The facility met all applicable requirements.

Training

On the morning of November 10, 2009, Duane Nelson from the Idaho Falls Fire Department provided the entire staff with First Aid, CPR and AED training.

The afternoon of November 10, 2009 was spent with NOAA's EEO representative and a NOAA contractor in EEO training.

Travel

Kirk Clawson and Tom Strong, to Las Vegas, NV, November 16-19, to install sonic anemometers for an EPA project.

Richard Eckman and Tom Strong, to Kitty Hawk, NC, December 7-10, to retrieve ET Probe.

Misc.

All employees received their Common Access Cards to replace the NOAA-issued ID cards.